

## Depth of Penetration

A thorough assessment of assurance activities includes a review of the scope and breadth, i.e., the depth of penetration, of the activities.

Assurance agents can have differing levels of involvement based on position within NASA Headquarters; the program or project; mission assurance division; contractor; or an independent assessment organization. Proximity to the design and testing of hardware and software requires more frequent and more thorough interactions, however this can vary from actual participation to detailed monitoring of tasks and processes. Management and oversight groups can have deep penetration into such activities, but more commonly evaluate metrics and data at a more infrequent schedule.

When developing the matrix section of an Assurance Process Map, a range of values can be developed for charting the depth of penetration of assurance activities ranging from no penetration to complete penetration. In the example provided below, the assessment of the scope and breadth of the chief engineer's activities is reflected in a range denoting total penetration for some activities while less in-depth responsibilities for others.

### Levels of Assurance Process Capability

#### Levels of Penetration

0. No Penetration
1. Low Penetration - Evaluation of customer feedback and assessment of the supplier's data and metrics, including reviewing a minimum set of information to assure compliance with requirements.
2. Basic Penetration - Assessment of the supplier's processes, including daily or weekly involvement in processes / tasks to identify and resolve issues and assure product or process compliance.
3. Intermediate Penetration - Task observation of the supplier's processes, including sampling a minimum set of product or process data to assure product or process compliance.
4. In Depth Penetration - In depth observation of the supplier's processes, including independent assessments and detailed monitoring of the processes / tasks
5. Total Penetration - In-line involvement with the supplier's processes, including complete and independent evaluation as well as detailed participation in the processes / tasks.

#### Levels of Independence

0. Program/Project Manager's In-Line Checking Functions / Reports Assessment to Program Manager (e.g., SSP/SMA managers, quality assurance, inspection)
1. In-Line Resources for Assurance Activity / Reports Assessment to Authorities Within Upper Line Management (e.g., NASA/HQ OSF Review Team)
2. Organizationally funded / Not In-Line / Reports Assessment to Upper/Top Program Line Management (e.g., NASA SMA Review Team, NASA HEDS Assurance Board)
3. Organizationally funded / Not In-Line / Reports Assessment to Organizational Authority Outside (above) Program Line Management (e.g., NASA Aerospace Safety Advisory Panel)
4. Organizationally Funded / Reports Assessment to Authorities Outside Organization (e.g., funded by NASA and reports to Congress or White House - Gehman Board, Rogers Commission)
5. Receives Resources from and Reports to a Different Organization (e.g., General Accounting Office).

### Example Depth of Penetration Matrix Entry

**NESC APL Chief Engineer**  
**Depth of Penetration Level 4-5**  
In-depth observation and participation in supplier processes. Approval authority in some cases